CLAIMS

1. Polymerizable composition for making episulfide based resins comprising :

A) at least one episulfide compound bearing at least one episulfide and at least one functional group capable of polymerizing with episulfide groups, and

B) an effective amount of a polymerization catalyst system comprising :

- at least one salt of formula

$$M_m^{p+} \quad Y_n^-$$

wherein

M^{p+} is a cation selected from the group consisting of alkaline metals, alkaline earth metals, transitions metals and ammonium groups of formula NR^+_4 in which R is an alkyl radical,

Y^- is an anion such as the corresponding acid YH gas a pKa fulfulling the condition $0.5 \leq pKa \leq 14$ with the proviso that when M^{p+} is an ammonium group, the catalyst system further comprises an electro-donor compound,

P is the valency of the cation,

n = mxp, and

- at least one tertiary amine.

2. Polymerizable composition according to claim 1, wherein the associated acid YH has a pKa fulfilling the condition $0.5 \leq pKa \leq 8$.

3. Polymerizable composition according to claim 1, wherein Y^- is selected from the group consisting of thiocyanate, carboxylate, thiocarboxylate, RS^- wherein R is a substituted or non-substituted alkyl group or phenyl group, acetylacetonate, diketone, acetoacetic ester, malonic ester, cyanoacetic ester, and ketonitrile.

4. Polymerizable composition according to claim 1, wherein the cation M^{p+} is selected from the group consisting of Li^+, Na^+, K^+, Rb^+, Mg^{2+}, Ca^{2+}, Ba^{2+} and Al^{3+}

5. Polymerizable composition according to claim 1, wherein the salt is KSCN.

6. Polymerizable composition according to claim 1, wherein the salt is present in amount of 0.001 to 2.5%, based on the total weight of the polymerizable monomers present in the composition.

7. Polymerizable composition according to claim 6, wherein the salt is present in an amount of 0.001 to 1% based on the total weight of the polymerizable monomers present in the composition.

8. Polymerizable composition according to claim 1, wherein the tertiary amine has formula :

$$(R)_3N$$

in which the R groups represent, independently from each other, an alkyl radical, a cycloalkyl radical or mixtures thereof.

9. Polymerizable composition according to claim 1, wherein the tertiary amine is selected from N,N-dimethylcyclohexylamine, N,N-dicyclohexylmethylamine and mixtures thereof.

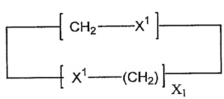
10. Polymerizable composition according to claim 1, wherein the tertiary amine is present in the composition from 0.05 to 5%, based to the total weight of the polymerizable monomers present in the composition.

11. Polymerizable composition according to claim 10, wherein the tertiary amine is present from 0.05 to 2%.

12. Polymerizable composition according to claim 1, further comprising an electro-donor compound enhancing the reactivity of the polymerization reaction.

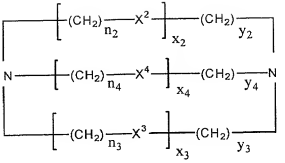
13. Composition according to claim 12, wherein the electrodonor compound is selected from the group consisting of acetonitrile compounds, amide compounds, sulfones and sulfoxides, trialkylphosphites, nitro compounds, ethyleneglycol ethers, crown ethers and kryptates.

14. Composition according to claim 13, wherein the crown ethers and the kryptates are selected from the compounds of formulae :



(II)

and



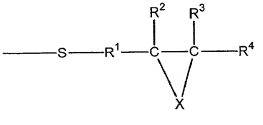
(III)

wherein X^1 represents O, S or NH, x_1 is an integer from 3 to 6,

X^2, X^3 and X^4 represent O or S, n_2, n_3, n_4, y_2, y_3, y_4 are 2 or 3, and x_2, x_3, x_4 are 2 or 3.

15. Composition according to claim 13, wherein the electro-donor compound represents up to 5% by weight of the total weight of the polymerizable monomers present in the composition.

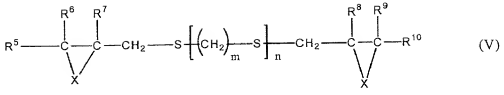
16. The composition of claim 1, wherein the episulfide monomer comprises one or more episulfide structure of formula :



(IV)

in which R^1 represents a hydrocarbon group having 1 to 10 carbon atoms, R^2, R^3 and R^4 each represents an hydrogen atom or a hydrocarbon group having 1 to 10 carbon atoms, X represents S or O with the provisio that in the molecule the average number of S represented by X is about 50% of the total number of S and O constituting the three membered ring.

17. Composition of claim 1, wherein the episulfide monomer is a compound of formula :



(V)

in which R^5, R^6, R^7, R^8, R^9 and R^{10} each represents an hydrogen atom or a hydrocarbon group having 1 to 10 carbon atoms, X represents S or O with the proviso that, in the molecule, the average number of S represented by X is about 50% or more of the total number of S and O constituting the three member rings, m represents an integer from 0 to 6 and n represents an integer from 0 to 4.

18. The composition of claim 17, wherein X is S.

19. The composition of claim 1, wherein the polymerizable monomers comprise solely episulfide monomers.

20. The composition according to claim 1, further comprising one or more polythiols of formula :

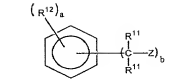
$$R'(SH)_{n'}$$

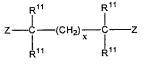
in which n' is an integer from 2 to 6 and R' is an organic group of valency equal to n'.

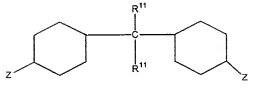
21. The composition according to claim 20, wherein the polythiol represents 0 to 30% by weight of the total weight of the polymerizable monomers present in the composition.

22. Composition according to claim 1, further comprising one or more polyiso(thio)cyanate monomers.

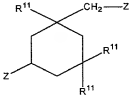
23. Composition according to claim 22, wherein the polyiso(thio)cyanate monomers are selected from the compounds having the formulae :







and



wherein :

R^{11} is independently H or C_1-C_5 alkyl group,

R^{12} is H, an halogen, or a C_1-C_5 alkyl group,

Z is –N=C=O or –N=C=S ;

a is an integer ranging from 1 to 4, b is an integer ranging from 2 to 4 and $a + b \leq 6$; and

x is an integer from 1 to 10.

24. Composition according to claim 23, wherein the polyiso(thio)cyanate monomers are selected from the group consisting of tolylene diiso(thio)cyanate, phenylene diiso(thio)cyanate, ethylphenylene diiso(thio)cyanate, isopropyl phenylene diiso(thio)cyanate, dimethylphenylene diiso(thio)cyanate, diethylphenylene diiso(thio)cyanate, diisopropylphenylene diiso(thio)cyanate, trimethylbenzyl triiso(thio)cyanate, xylylene diiso(thio)cyanate, benzyl triiso(thio)cyanate, 4,4'-diphenyl methane diiso(thio)cyanate, naphtalene diiso(thio)cyanate, isophorone diiso(thio)cyanate, bis(iso(thio)cyanate methyl) cyclohexane, hexamethylene diiso(thio)cyanate and dicyclohexylmethane diiso(thio)cyanate and mixtures thereof.

25. Composition according to claim 22, wherein the polyiso(thio)cyanate monomer or the mixture thereof represents 0 to 30% by weight of the total weight of the polymerizable monomers present in the composition.

26. Cast article resulting from room temperature and/or thermal polymerization of a composition according to claim 1.

27. Cast article according to claim 26 which is an optical lens.

28. Process for making a cast episulfide based resin article comprising :

- preparing a composition as set forth in claim 1;
- filling a mold with the prepared composition ;
- heating the filled mold at a first temperature of 50°C or less up to the obtention of a gel ;
- thereafter, heating at a second temperature higher than the first temperature up to the obtention of a hard resin ; and
- removing the cast article from the mold.

29. The process according to claim 28, wherein the first temperature ranges from 20°C to 50°C.

30. The process according to claim 28, wherein the second temperature ranges from 60 to 90°C.

31. The process according to claim 28, wherein heating at the first temperature lasts for 15 minutes to about 1 hour and heating at the second temperature lasts for about 2 hours.

32. The process according to claim 28, wherein the cast article is an optical article.